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Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Office of the Secretary Of Defense **Date:** March 2024

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603781D8Z / <i>Software Engineering Institute (SEI)</i>
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COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	11.874	16.699	16.982	-	16.982	17.383	17.743	18.130	18.494	Continuing	Continuing
781: <i>Software Engineering Institute (SEI)</i>	-	11.874	16.699	16.982	-	16.982	17.383	17.743	18.130	18.494	Continuing	Continuing

Note

New Start (Y/N): No

This Software Engineering Institute (SEI) Advanced Technology Development Program Element (PE) applies the software and computer science concepts developed under the 0602751D8Z PE to research, develop, and rapidly transition state-of-the-art software technology, tools, development environments, and best practices to improve the engineering, management, fielding, evolution, acquisition, and sustainment of software-intensive Department of Defense (DoD) systems.

A. Mission Description and Budget Item Justification

This program supports the Departments initiatives to Build a Sustainable and Long-Term Advantage, and Build a Resilient Joint Force and Defense Ecosystem.

Software is more pervasive than ever, and computer programs are growing in size and complexity. Designing, managing, and securing integrated, complex, and large-scale mission-critical systems are abilities that the Department of Defense (DoD) and the Defense Industrial Base (DIB) have not yet mastered. Reliance on software-intensive mobile and net-based products and systems has increased (e.g., Joint Tactical Radio System, USS ZUMWALT (DDG-1000), Joint Strike Fighter, F-22, and Army Modernization). As stated in the February 2018 Defense Science Board Report, "Design and Acquisition of Software for Defense Systems," software is a crucial and growing part of weapons systems and the national security mission, and the DoD must address its ability to build and sustain software continuously and indefinitely. With growing global parity in software engineering, the DoD must maintain leadership to ensure a competitive advantage.

The Software Engineering Institute (SEI) Federally Funded Research and Development Center (FFRDC) was established in 1984 as an integral part of the DoD's initiative to identify, evaluate, and transition software engineering technologies and practices. The mission of the SEI is to provide the DoD with technical leadership and innovation through research and development to advance the practice of software engineering and technology. The SEI works across government, industry, and academia to improve the state of software engineering from the technical, acquisition, and management perspectives. The SEI engages in research and development of critical software technologies and tools and collaborates with the larger software engineering research community. It facilitates rapid transition of software engineering technologies into practice and evaluates emerging software engineering technologies to determine their potential for improving software-intensive DoD systems. Since its inception, the SEI has helped to transform the fields of software engineering and acquisition, network security, real-time systems, software architectures, and software-engineering process management.

The SEI program element (PE) addresses the critical need to research, develop, and rapidly transition state-of-the-art software technology, tools, development environments, and best practices to improve the engineering, management, fielding, evolution, acquisition, and sustainment of software-intensive DoD systems. The

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research conducted by this PE directly benefits the technical domains, such as Command, Control, Communications, Computers, and Intelligence (C4I), Autonomy and Artificial Intelligence (AI), Cyber, and Engineered Resilient Systems.

B. Program Change Summary (\$ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Previous President's Budget	12.306	16.699	17.119	-	17.119
Current President's Budget	11.874	16.699	16.982	-	16.982
Total Adjustments	-0.432	0.000	-0.137	-	-0.137
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.431	-			
• Program Adjustments	-0.001	-	-0.171	-	-0.171
• Economic Assumptions	-	-	0.034	-	0.034

Change Summary Explanation

Reduction of \$0.171 million in FY 2025 was applied to meet DoD overall funding reductions, which were spread to mitigate impact. Funding increase of \$0.034 million in FY 2025 for Economic Assumptions.

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COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
<i>781: Software Engineering Institute (SEI)</i>	-	11.874	16.699	16.982	-	16.982	17.383	17.743	18.130	18.494	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project focuses on two main research thrusts with known military applications: (1) Software Engineering, Systems Verification and Validation, and Mission Assurance (formerly Mission Assurance); and (2) Information Assurance.

Software Engineering Institute (SEI) research focuses on the most significant and pervasive software challenges within the Department of Defense (DoD), such as the scalability and reliability of software assurance, supply chain risk management, validation of and trust in autonomous systems, human-computer and human-technology teaming and interaction, computing and communication at the tactical edge, and efficiency and performance of acquisition strategies and software development appropriate for a contested cyber environment.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2023	FY 2024	FY 2025
Title: SEI Advanced Technology Development in the Area of Software Engineering, Systems Verification and Validation, and Mission Assurance	8.210	14.902	15.118
Description: This research seeks to mature and rapidly prototype techniques to verify methods for identifying requirements, systems of systems architectures, and virtual integration of components. Furthermore, research in this area will pursue rapid prototyping and transitioning of capabilities that verify requirements for software assurance, analysis/control of unverified code and automated repair of damaged code. Software production and code analysis methods developed through this program will also improve the ability to predict how complex software systems, including AI-enabled systems, will behave in untested environments. Increasingly, large numbers of lines of code and the addition of machine-learning techniques will require a commensurate increase in sophisticated verification and validation mechanisms.			
FY 2024 Plans: Integrate techniques in system measurement, software development and operations, and model based systems engineering for an automated assessment, modeling, and software deployment process. Focus on strategies for resilience and mission assurance in large complex infrastructures and develop prototype systems that can be transitioned and tested into DoD applications from cloud to embedded systems.			
FY 2025 Plans: Integrate techniques in automated learning for system measurement, software Development and Operations, and model-based systems engineering for an automated assessment, modeling, and software deployment process. Focus on strategies for			

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2023	FY 2024	FY 2025
resilience and mission assurance in large complex infrastructures and develop prototype systems that can be transition and tested into DoD applications from cloud to embedded systems. FY 2024 to FY 2025 Increase/Decrease Statement: The increase of \$0.216 between FY 2024 and FY 2025 reflect additional investment in developing system measurement techniques, along with system prototypes.				
Title: SEI Advanced Technology Development in the Area of Information Assurance Description: Powerful machine learning algorithms can be subverted by malicious manipulation or falsification of data collected through normal channels. Algorithms must be trusted and effective in the presence of adversaries. This thrust seeks to defend against and minimize the impacts of information falsification attacks. FY 2024 Plans: Enable combined risk analysis between software, machine learning, and cyber security to enable assessment and management of automated systems. These risk metrics will be introduced to a variety of DoD applications from system assessment, to enterprise cloud analytics, and legacy embedded systems. FY 2025 Plans: Enable combined distributional machine learning for risk analysis between software, machine learning, and cyber security to enable assessment and management of automated systems. These risk metrics will be introduced to a variety of DoD applications from system assessment, to enterprise cloud analytics, and legacy embedded systems. FY 2024 to FY 2025 Increase/Decrease Statement: The increase of \$0.067 million between FY 2024 and FY 2025 reflect minor budget fluctuations.		1.734	1.797	1.864
Title: Artificial Intelligence Engineering Initiatives Description: Artificial Intelligence (AI) engineering is an emergent discipline focused on developing tools, systems, and processes to enable the application of AI in real-world contexts. The rise in availability of computing power and massive datasets have led to the creation of new AI, models, and algorithms encompassing thousands of variables and capable of making rapid and impactful decisions. Too often, though, these capabilities work only in controlled environments and are difficult to replicate, verify, and validate in the real world. The need for an engineering discipline to guide the development and deployment of AI capabilities is urgent. AI engineering aims to provide a framework and tools to proactively design AI systems to function in environments characterized by high degrees of complexity, ambiguity, and dynamism; and aims to equip practitioners to develop systems across the enterprise-to-edge spectrum, to anticipate requirements in changing operational environments and conditions, and to ensure human needs are translated into understandable, ethical, and thus trustworthy AI.		1.930	-	-

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2023	FY 2024	FY 2025
Accomplishments/Planned Programs Subtotals	11.874	16.699	16.982

C. Other Program Funding Summary (\$ in Millions)

<u>Line Item</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u> <u>Base</u>	<u>FY 2025</u> <u>OCO</u>	<u>FY 2025</u> <u>Total</u>	<u>FY 2026</u>	<u>FY 2027</u>	<u>FY 2028</u>	<u>FY 2029</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• BA 2, RDT&E, PE # 0602751D8Z: <i>Software Engineering Institute Applied Research</i>	9.788	11.168	11.310	-	11.310	11.570	11.812	12.068	12.309	Continuing	Continuing

Remarks

D. Acquisition Strategy

N/A